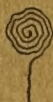


# AREAS OF DESOLATION IN PENNSYLVANIA

BY

J. T. ROTHROCK, M.D., S.B.

FORMERLY COMMISSIONER OF FORESTRY OF PENNSYLVANIA



HERBERT WELSH

995 DREXEL BUILDING, PHILADELPHIA

1915











PENNSYLVANIA ONCE HAD HUNDREDS OF SQUARE MILES OF SUCH WHITE PINE AS THIS.  
IT IS NOW PRACTICALLY ALL GONE

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*rough  
trouble*  
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## What Would You Do: Restore Forests on Non-Agricultural Land, or Im- poverish the State?

PENNSYLVANIA is divided into two parts, a prosperous and a desolated part. It is to Desolated Pennsylvania that this paper refers. It concerns the thousands of square miles which were robbed of the timber in advance of any actual need and the naked soil abandoned for fire and flood to impoverish and make unproductive!

This land is not in one connected whole. It is scattered over the central parts of the State, on the highest plateaus, about the head-waters of the streams and on the shaly slopes of the inferior ridges. Agriculture has been attempted on a portion of it, but proved so unremunerative often that the land and the farmer grew poorer with each succeeding year.

If it were possible to gather these acres together, they would make an area 80 miles long and 80 wide, which is about one-seventh the area of the State.

The lifetime of an individual is as nothing in the life of a commonwealth, for the ideal State lives forever, and its highest function is to provide for its own prosperous perpetuity. Failing in this, patriotism languishes, and respect for government disappears.

No State in which one acre out of seven is unproductive through neglect, or improper care, can be considered as on the high road to perpetual prosperity. To have its soil become poorer as its population in-

creases, means loss of power in comparison with other States whose natural resources are better managed.

It is an astounding statement that I make, when I say, as I do now, that in my lifetime I have seen practically one-seventh of this Commonwealth cease to produce wealth, power, or food for the remainder of the State!

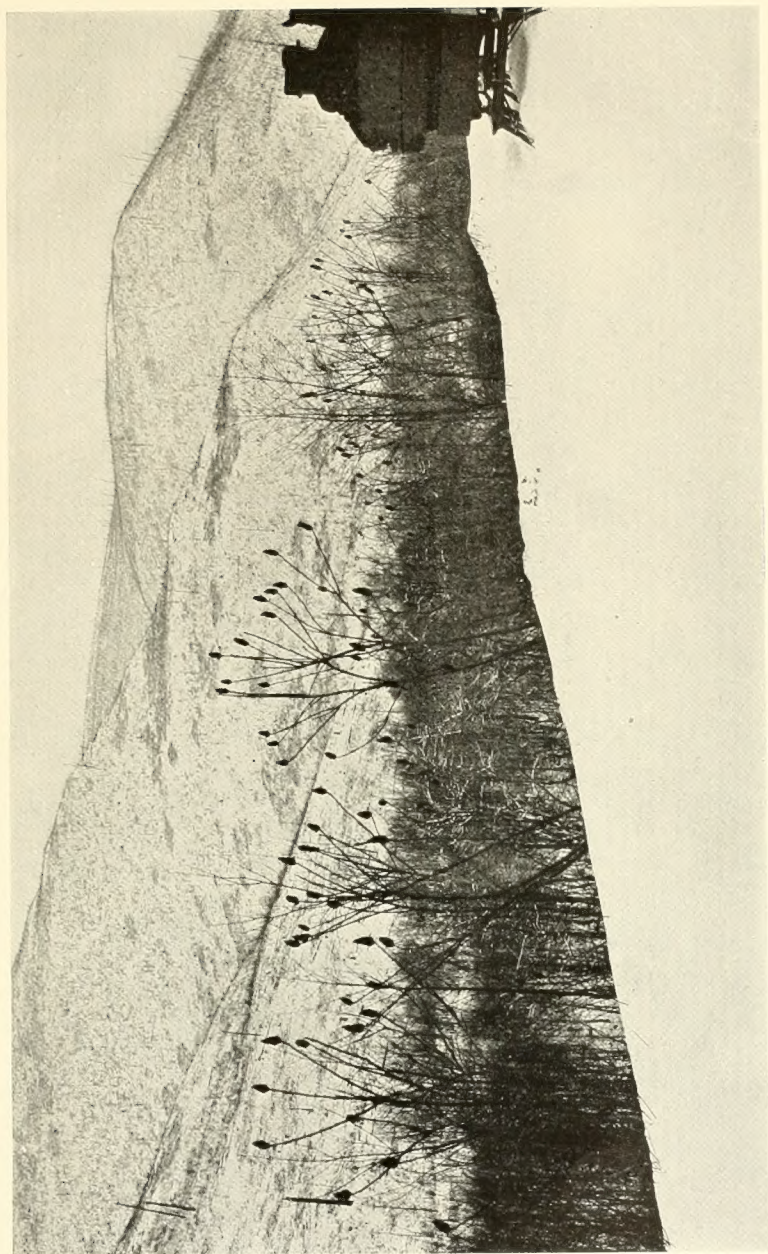
In this estimate I have not included those portions of the coal fields on which neither farms nor forests are found, but which already present so desolate an appearance as to suggest the inquiry: What is to happen there when the mining ceases?

My distinct recollection extends back at least sixty years. The railroads were just opening the way to the markets and, as a consequence, lumbering began on a scale previously unknown. What the rafts had carried out of the woods was as "a drop in the bucket" in comparison with what the railroads were to take out to the centers of demand.

From the mouth of the Sinnemahoning, northwest to the Allegheny River at Warren, 75 miles as the crow flies, was an almost unbroken forest. There was no house where the town of Kane now stands. Ridgway and Johnsonburg were just lifting their heads out of the woods. I walked from Clearfield to Saint Mary's and thence to Smethport—60 miles; most of the way through glorious white pine and hemlock forests, of which hardly a vestige now remains. Those forests are but a memory!

Do not misunderstand me. I have no contention with the lumbermen of those days. The timber was there. It was mature. It was *thought* to be needed as fast as it was cut. At least there was a market for





A PORTION OF 6400 SQUARE MILES OF DESOLATED PENNSYLVANIA; KETTLE CREEK, POTTER COUNTY









SUCH HEMLOCK ONCE COVERED HUNDREDS OF SQUARE MILES WHICH ARE NOW DESOLATED AND PRODUCING NOTHING OF VALUE

it—and such timber! Soft white pine, the cutting of which was a luxury; no knot to dull the knife or axe! Who could blame the purchaser for refusing all but the best, when it could be had at a reasonable rate? No one wanted inferior grades! The lumberman could hardly be expected to handle them at a loss to himself. There was so much white pine that there was no market for hemlock; when it (the hemlock) was cut, the bark was stripped and sold to the tanner, but the logs were left to bleach and rot where the tree fell. No end of timber; no end of prosperity. Those were great times!

But an end did come. Those hillsides—black with forest wealth, the State sold, timber and all, for  $26\frac{2}{3}$  cents an acre—are for the most part bare now. Fire has swept over them and destroyed the new growth, such as it was, and the snows of winter and the rains of summer have washed the soil away, until many farms that were started where the forests stood have been abandoned because of the impoverished soil.

The men who cut the trees and the men who sawed the logs into lumber have left. The country is the poorer because they have gone; for they were industrious, strong-armed, brave-hearted men.

But how about the land? Too poor to farm for the most part, often without mineral resources, it was simply abandoned, practically uncared for. To-day one may safely say there are 3,000,000 acres of such unprotected land in the State of Pennsylvania.

Surely there must be fault somewhere; who is to blame? No one in particular! As a people we were dazed over what we thought the inexhaustible stock of timber. The tremendous increase of population, the enormous demand to be made upon the forests,

were not anticipated. And we cut and kept on cutting and shut our eyes to the fact that the end was approaching.

The mistake was that we failed to realize that production of forests was the one predestined function of our mountain ranges and stony ridges, and, of course, as a consequence no one thought of putting them back to timber—as Germany, France, or Switzerland would have done. If productive forestry had been understood at the time here, we might have had forests well advanced toward maturity since the zealous cutting for lumber purposes began, and the mould and soil still remaining upon a fertile forest floor!

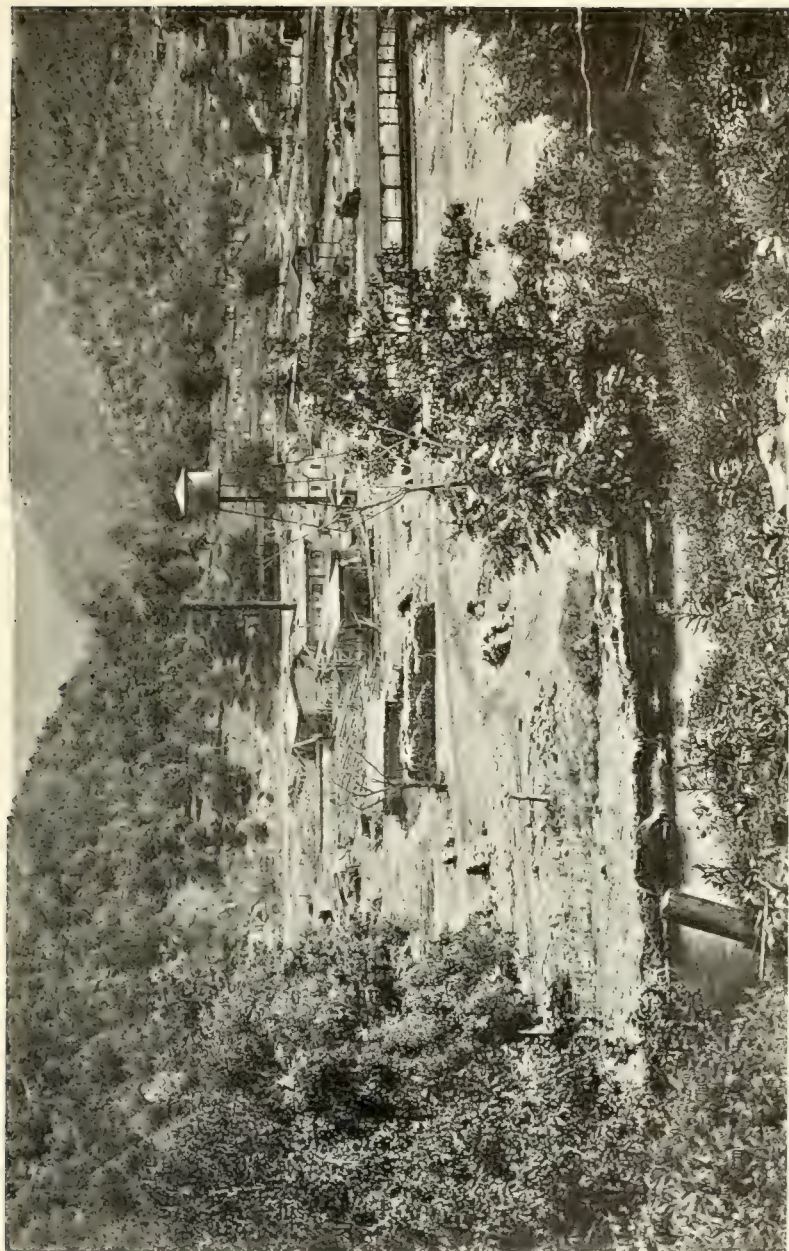
A great wrong has been done the soil by our failure to return to it the forest crop for which it was fitted; and through wrong to the soil we have done a greater wrong to those for whom we, by divine appointment, held the land in trust—our children!

Of those who did the lumbering, comparatively few became wealthy. The reward for their industry was not great. Lumber was thrust on to the market in advance of actual pressing need, and the consequence was that prices, even for the best, fell below a normal rate; but, all the same, an irreparable injury was inflicted upon the country, a wrong so great and so unnecessary that even the phenomenal development and prosperity of those days cannot atone for it.

Ignorance often invites, but seldom averts, a penalty.

To-day the lesson of China compels our attention. To what extent can we, by prompt action, escape the penalty invoked by violation of natural law when the protecting forest cover was removed and fire and flood invited to do their worst on our steep, rocky slopes?





A TYPICAL LUMBER TOWN









"FOU-PING, CHI-LI PROVINCE, CHINA. ORIGINALLY WOODED; SETTLED, CLEARED, RUINED SINCE 1725"; *i. e.*, ONE HUNDRED AND NINETY YEARS.  
Illustration from U. S. Geological Survey



BOTTOM LANDS BURIED IN WASTE FROM DEFORESTED MOUNTAINS, WU-TAI-SHAN, SHAN-SI PROVINCE, CHINA  
Illustration from U. S. Geological Survey

A glance at the hills of Kettle Creek, Anderson Creek, or the Sinnemahoning is a good preliminary to the study of the torrent washed, treeless hills of China! The upper illustration facing this page represents a scene in Fou-Ping, Chi-li Province, China. It bears this legend: "Originally wooded; settled, cleared, ruined since 1725, that is 190 years of history." There is nothing remarkable in the scene. It is merely the expression of a natural law. It is what we may expect to have here as well as in China, if we leave steep hill-sides unprotected by some effective cover. The lower illustration, "A Pennsylvania Washout" (facing page 15), shows what one summer shower can do in the way of commencing desolation. Every particle of matter on our highlands is on its way to the ocean level, so long as the law of gravitation exists. The more soluble the substance is, the more rapid is its descent to the water level; lost to our productive acres.

A senator of the United States, a gentleman who had made his fortune by lumbering, once stated in a public meeting in Washington that the white pine was doomed, that there was no help for it, that it could not be reproduced.

In matters involving essential public policy, senators should be better informed. At the very hour of his utterance white pine seed, grown from mature trees in Germany, was being used in this country to produce seedlings for use in our forest nurseries. It is furthermore noteworthy that this imported white pine seed came from trees, or seeds, imported into Germany nearly a century ago from North America. It is fair to say that white pine is among the easiest of our forest trees to reproduce.

Forests of white pine, grown from nursery sown seed, are now well advanced on the Biltmore estate in North Carolina. The earliest plantation on the forest reserve at Mont Alto is now 15 feet high, and is in as thrifty a condition as any of natural growth. What is true of white pine is true of every other valuable species of our native trees, with the possible exception of chestnut and black locust, which have foes of their own. Every forester, every nurseryman, knows this to be true. It is time to make and insist unequivocally on the statement that delay in reforestation of every acre of land now practically abandoned in the State of Pennsylvania, unless it can be immediately set out to some better use, will entail in future an enormous expense—a debt which our successors must bear. Proper care of the soil is the most important function of government, for on it not only the life of the community depends, but the stability of the government itself.

How vast an undertaking this is can be realized only by those who carefully consider the problem. The work will extend over so long a period, before large financial returns can be expected, that it must either be done by, or encouraged by, the State.

Not only in the interest of wood-using industries, but in the interest of those requiring mechanical power, restoration and protection of our forests is a public duty.

Every gallon of water that flows away unutilized is so much power wasted. In one sense it is worse than wasted, because to do the work it might have done the utilization of some non-restorable source of power was required. For example, coal!



If on a winter day, after a period of freezing weather, one goes into a forest on which there lies a bed of autumn leaves, it will probably be noticed that the soil beneath is not frozen; that an iron-pointed cane can be easily thrust into the depths. The leaves perform exactly the function for the earth that clothing does for a man. They retain the heat—in the one case, of the earth, in the other, of the body. In addition to this, there is another force at work. The oxygen of the air is uniting with the carbon of the leaves and a slow combustion is going on. Thrust your hand into a thick bed of decaying leaves or straw, and note the heat. This heat, not in itself great, is nevertheless a constant factor in preventing the soil in the forest from freezing.

Change the experiment, go out on to the surface of a field and try to thrust the cane into the depths of the soil and one will discover that a resisting surface prevents the iron from entering. It is the frozen surface of the soil. This is a fair statement of facts for average winter weather in the State of Pennsylvania. The cold, in exceptional cases, freezes the soil in both woods and fields, and, on the other hand, the season may be so mild as to freeze neither wood nor field soil. Furthermore, in the woods where forest fires have destroyed the bed of leaves the ground may be frozen, and, on the contrary, a very heavy mulch of grass in an open field may prevent the soil of the field from freezing, but neither of these exceptional cases invalidates the general truth that in winter the leaf covering of the forest floor prevents the soil beneath from freezing and that the absence of an equivalent covering in the field allows the soil to freeze.

There is a common belief that open fields, if not frozen when a considerable body of snow falls upon them, will remain unfrozen. This, however, is not always the case. In long-continued, severe, freezing weather ground may freeze even under a foot of snow. When a thaw begins and no water escapes from the snow-bank, it is not necessarily because it is going into the ground. Such water is often absorbed by the snow until the latter is saturated. When this occurs, the water may escape as surface water.

This all bears directly upon the question as to whether or not forests aid in conserving rain or snow fall.

The most positive evidence of the water-conserving capacity of forests may be observed during a sudden thaw in January or February, when small streams in farming regions are quickly made bank full by escape of water over a frozen surface from but a few inches of melting snow. At the same time temporary lakes are formed in the depressions from which the water cannot escape. Trials made of the fields show that the water is not going into the ground. Examination made of an adjacent forest floor shows that there is an active absorption of water there until actual saturation of soil is reached.

Such facts as these appear conclusive, even in the absence of more elaborate observations of the meteorological stations.

Production of power has become one of the dominant questions. That the supply of coal is limited, that it must become more costly as the years pass, that once used it cannot be restored, is axiomatic.

Squandering a non-restorable power to accomplish





SOME UNUTILIZED WATER POWER



work which can as well be done by a restorable power is almost a crime. Pennsylvania possesses a vast undeveloped water power; just how much it is impossible yet to say. In this connection, however, it is important to insist upon the fact that the maintenance and increase of this power are closely associated with the restoration of our forests on such lands as have no agricultural value, and especially upon the higher and rougher lands of the State.

Recent reports inform us that 450 miles of the Chicago, Minneapolis & St. Paul Railroad are soon to be electrified, because (first) abundant power exists in the great falls of the Missouri; (second) because one-horse power steam costs annually \$150, while the same energy derived from electricity costs \$40; steam is wasteful; fire must be maintained while engines stand blowing off steam on a siding; for electrical service you simply cut off the power; (third) a freight locomotive runs 150 miles and then goes to the round house; an electrical engine runs 1200 miles before being returned to round house for repairs. I have made these statements on what seems to be competent authority.

It must be remembered, the question of water power is not one merely of the volume of rain or snow fall; for much of that power might run out of the country unutilized when business is slack. The most important factor is the volume of persistent power: that which may be depended upon when needed.

It is in this aspect that the forest covering becomes so important, because it is the water which soaks into the ground and not that which flows off of the surface upon which a sustained water supply depends. The fact is clearly established by our Government investi-

gators that the level of the ground water is steadily becoming lower; that in order to secure a permanent water supply for our homes we must dig to greater depths. We cannot well overestimate the importance of this discovery; for the rapidity with which the water level has lowered over wide areas starts very serious questions as to the many future needs of a constantly increasing population.

There is still another relation existing between our forests and water in which we can readily notice the *danger* of water on cleared ground. To put the problem in concrete form, study the condition along the main line of the Pennsylvania Railroad near, say, Tuscarora Station. On the one side you have Juniata River, on the other the slope which has descended a thousand or more feet from a timber-covered, rocky mountain. We will suppose that one of the torrential summer rains has occurred a few hours before. On the river side you will see a muddy, more or less swollen stream. The muddy color is due to the wash from the fertile farm lands through which the river has come. It represents the best, most soluble part of the soil. Its loss is in every instance a detriment to the farm from which it has come. On the mountain side of the road-bed you will see many small streams tumbling down over a rocky bed; but, if you observe closely, you will find that the water is usually almost clear, sometimes it is wholly clear, and it is almost never muddy; though, owing to the steeper slope down which that water has come, the tendency to washing out of soil was greater than on the river side. The reason is plain: on the forest floor the bed of leaves arrested the rapid flow of water, covered and protected the soil,



A FLOOD-SWEPT CHANNEL DRAINING TIMBERLESS HILLS IN CENTRE COUNTY, PENNSYLVANIA





while the roots descending between the rocks served as lines along which much of the water penetrated into the depths.

Fertile soil is perhaps the most precious inheritance we have received from the long past. It forms but a small part of the earth upon which we tread. Once removed, or destroyed, it is with great difficulty restored. Without it no crop can be raised. In the eternal round of things it is constantly moving to the ocean level, and is constantly being formed again. The rate of its removal and the rate of its formation are the factors which determine whether the capacity for production of food is increasing or diminishing. On the farms the one problem is how to maintain the fertility of the soil; in the forest the soil of itself renews its fertility.

But under all conditions there is a certain wear of the earth's surface. It is greatest on steep, treeless slopes, unless they be so rocky as to resist erosion. There are thousands of acres of such steep hillsides in Pennsylvania on which nothing but rocks appear, the soil having been washed away. But trees or no trees, the wear goes on, though infinitely slower with, than without, trees.

Pennsylvania has a wonderful history. "Our mountains were once ten times higher than they are now; and their gradual erosion to their present height by the frosts and rains of past ages, beginning long before the advent of the races of living beings which now inhabit the planet, makes the most interesting chapter in our geological history."

One-fourth of the State has a general level of 2000 feet above sea. It seems once to have been almost a

continuous plateau, which has been cut into ridges, crossed by gaps until it is changed into what seems like one mountain range after another as far as the eye can reach. Striking examples of such erosion are seen in the region of the west branch of the Susquehanna, at the first fork of the Sinnemahoning and on Fish Dam Run.

To produce such marked effects, long periods of time were required. Even while the valleys were being washed out, or the ridges cut through, forests were growing on the soil. As the large trees fell, smaller ones came to take their places, to cover the slopes and the level ground with leaves and soil, to hold back and render as slow as possible the constant wearing away of the earth.

When, in human history, the forests were cut away, the slow march of events became more rapid, soil was removed faster than it was made. The oldest seats of civilization are too often abandoned and in desert condition now. Study the problem from what point we may, the close connection between human prosperity and forests appears too plain to be disputed. The utter removal of the forests marks the beginning of desolation and the disappearance of man's power over nature.

One more look at these desolated hills! Observe, they are almost covered by rocks—no soil remains in sight. Time was when there existed enough soil there to support a vigorous hemlock forest. When the forest was removed, the soil followed, filtered out, washed away, and with it disappeared all prospect of immediate reforestation, except at great expense. This is an illustration of the growing problem which



#### VALLEY OF THE SUNNEMAHONING

The timberless hills, range beyond range, represent what erosion by water has left of the original plateau—2000 feet above tide. Valleys now from 800 to 1000 feet deep









SLATE RUN VALLEY

Once produced a heavy hemlock forest. Soil now washed out. Valley with enormous capacity for safe storage of water



A PENNSYLVANIA WASHOUT

What a single summer shower can do on unprotected soil

confronts the State. There are too many such hills in Pennsylvania to escape attention. Their condition is becoming worse each year. The problem is too large to ignore. Older nations, more experienced nations, have learned not only that such evils must be corrected, but how to correct them, though at a cost of millions of dollars where thousands would have sufficed if restorative measures had been applied earlier.

Desolated as they are, those hills still are of great value to the Commonwealth. They form solid boundaries within which immense water power may be safely confined. Take for example Slate Run, a branch of Pine Creek. It is probably ten miles long. From source to mouth it runs through just such a country as the upper illustration facing this page shows—ravines from 800 to 1000 feet deep. There are at least a dozen branches in which streams flow throughout the year, and in each of which a vast volume of water might be hoarded and electrical power generated on the spot, transmitted to where needed and the water passed on to be used again, multiplying power over and over many times.

It is hard, indeed, to exaggerate the manufacturing possibilities back of such topographical features! If the possibilities of Slate Run were multiplied fifty fold, they would not exceed the power latent in the valleys cut by erosion from the high table-land of the State.

It is humiliating to think how little our people know about these resources that are off of the line of travel. Such of them as are on the State forest reserves should continue to remain in its possession, to be used for the benefit of all the people. The world is surely but slowly learning that unappropriated natural

resources should remain as a trust, to be administered for the public.

There is a vision behind the cloud, for those who can see it. Back of all thus far alluded to in this brief paper there looms up a great truth: Congestion of our population in and near our cities leads to want when work is scarce, and to discontent and unrest even when it is abundant. Housing conditions, due to want of room, are bad. There is no family garden from which food may be obtained. The vegetables, the milk, the butter, the eggs, come from the grocer and can be had only when times are good and wages high. The surroundings are not favorable for good health or for good citizenship.

There is room for a vast population on the very regions under consideration, where there is good air, good water, room for the garden, the pasture, the poultry, of every family, often nearer the possible source of supply of raw material for manufacture, and with the power flowing in sight of the homes. The removal of many of the factory sites from near the cities to nearer the power-producing streams is possible. It appears reasonable. That it would be to the advantage of the workmen seems probable! From the business point of view it is more than likely that new conditions would be helpful to the manufacturer. Transportation of the finished product is usually cheaper than that of the raw material. There may be a social uplift in the idea.

That one-seventh of the State should continue in its present almost depopulated condition is an unthinkable proposition. Mountain-bred men have elements of character which have always distinguished them in



times of national need and trial. To point this statement it will be sufficient to say that during our Civil War the Southern Confederacy was "practically cut in two by the wedge of loyal mountaineers from the Appalachian chain," "and they startled the nation on the scene of our Civil War by sending 180,000 of their riflemen into the Union Army."\*

These Appalachian mountaineers were in no wise different in loyalty and in efficiency from the other mountain men bred and reared between Maine and northern Georgia. Until the millennium dawns and men cease to learn war, the human product of the timberland will continue to be one of the most important assets in our national life, if we furnish the means of earning a living in the forests where this stalwart character was developed. We cannot obliterate the fact that mountain men, unassisted, saved North and South Carolina and Georgia during the Revolutionary War and paved the way for the final surrender at Yorktown by their victory at King's Mountain. Neither may we forget that it was the woodsmen of Tennessee that saved the day for Jackson at New Orleans, in the war of 1812. It was the mountaineers of New Hampshire that prevented the escape of Burgoyne at Saratoga. It was in response to Ethan Allen's emphatic demand that Ticonderoga surrendered to the "Green Mountain Boys." Last of all should we of Pennsylvania forget that our 1st Rifle Regiment, the famous "Bucktails," came, in great part, from the lumber camps of the State.

I make my appeal for the Men of the Mountains as a part of our State and national forestry problem.

\* See Kephart's "Our Southern Highlanders," p. 19.

To New York belongs the great credit of being the first State to set apart, by purchase, a large body of woodland "*as an outing ground for the people.*" It was a long look ahead—the commencement of a policy in behalf of health and efficiency that but few people yet realize the beneficent consequences of. It is wiser to prevent than to cure disease. There are, all the time, in Pennsylvania and in every State, literally, thousands who are on the road to become confirmed invalids and charges upon the bounty of the public. It can no longer be questioned that a large portion could be restored to health and usefulness if removed from the unhealthy conditions in which they have lived, and placed in the open air of our Forest Reserves. Our splendid department of Public Health is doing a great work. Its only defect is, and it is a very serious defect, that it does not commence far enough back and begin in such cases at the beginning. Public charity too often sends such sufferers to some seashore or country boarding-place for rest and recreation, when better results would be more cheaply obtained in a wisely directed camp in the woods of the State.

Our Legislature of 1913-1914 wisely enacted that space for individual homes upon the Forest Reserves might be granted, under proper conditions. This privilege subserves two very important purposes: first, it conduces to public health; second, it places upon the ground men who are interested in the good of the State lands and especially in the prevention and prompt suppression of forest fires.

Many realize the benefits they individually receive from a sojourn in the woods; though but a small

proportion of these same persons recognize that the statement concerning the tree whose leaves were "for the healing of the nations" is neither fiction nor figure of speech.

Will nature, unassisted, restore forests to the waste places of the State? Certainly not, unless forest fires are absolutely prevented. It by no means follows, however, that the naturally restored growth is the best timber or, indeed, that it is timber at all in any proper sense of the word. There may be, for example, a dense growth of fire cherry, the only use of which would be as a nurse tree, or as an occupant to hold the soil until real timber could be well started under favorable conditions. One has but to go into a woods from which the original timber has been cut to realize that the new growth is more than likely to contain many species which have no commercial value, and others that have but little value, with but few specimens of our standard timber trees. Some carefully prepared tables of averages of "good, bad, and indifferent" species on given acres, which are reported as "well timbered," would effectually dispose of the notion that nature can be wholly trusted to do the work of reforestation.

The first essential in forestry is prevention of forest fires. In so far as we fail in this, we fail in the whole problem. The word *prevention* is used advisedly. Hitherto *extinguishing* forest fires and *suppressing* forest fires have been the leading ideas in our forest fire code. The one idea to get is that forest fires must be *prevented* by the presence of a sufficient patrol, assigned to the duty of preventing the start of fires; second, of promptly extinguishing them, if started, and, third, of discovering how the fire was started and

promptly bringing the offender to punishment. In a long life of woods experience, I have seen, in Pennsylvania, but two forest fires the creation of which could be clearly traced to lightning. It is not long since it was estimated that on an average of once in three years the "cut over land" of the State was burned. One may fairly say that there is already a marked improvement.

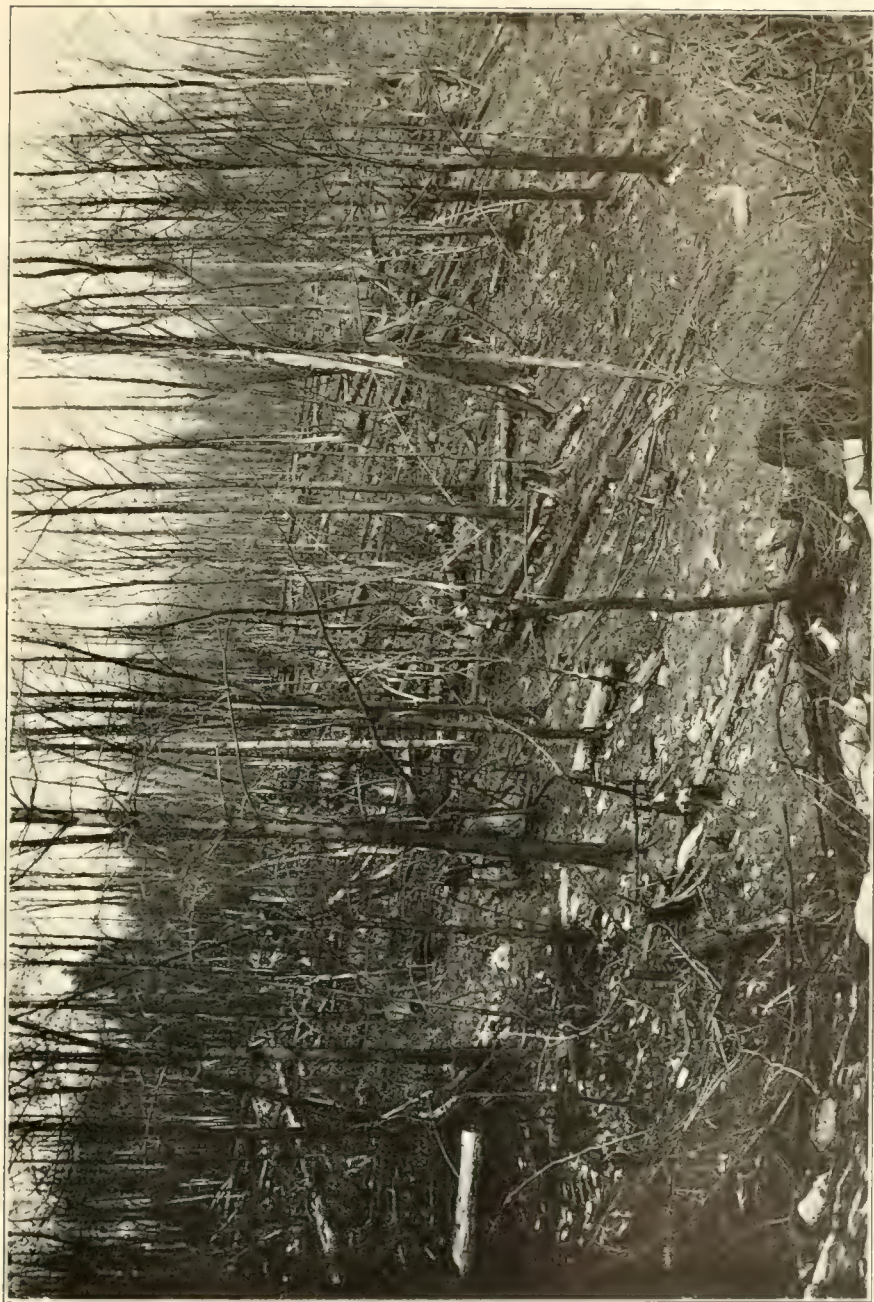
It is important to bear in mind that almost every forest fire is the result of ignorance, carelessness, or crime, and that there is some one to punish for it. To extinguish a forest fire after it has destroyed the growing timber costs about as much as preventing the fire by an efficient patrol and saving the timber. This is the verdict of experienced lumbermen who have tried both plans.

A carefully selected patrol has the distinct advantage of dispensing with the irresponsible, undisciplined mob that usually rushes to a forest fire, as much with the idea of getting what they can out of it, as with the intention of helping to extinguish it.

We must still be prepared to accept the fact that if forest fires are started, there will come times when they will defy the best efforts at prompt suppression. For example, in a fire starting in a dry, autumn bed of leaves, when sufficient water is not available and, as often happens, a high wind is prevailing, trails, fire lanes, roads will all be crossed and cinders and flaming bark may convey the conflagration from one side of a valley to another. Such extreme cases are rare, but they do occur.

Pennsylvania's restorative measures have thus far been confined mainly to planting on the abandoned





WHAT A FOREST FIRE DOES IN A "LUMBERING JOB"



fields within the forest reserve, though some "spot-planting" has been tried in existing woods, with greater or less success.

The methods of reforestation must necessarily be varied. In some instances clean cutting will be resorted to. In others, desirable seedlings will be used for "under planting" in forests deemed worthy of saving and which will not interfere with the growth of the newly planted seedlings. At one place the forests will be made up of but one kind of tree, say, for example, white oak—a "pure stand." At another place the forest will contain a mixture of desirable trees.

The one point desired to be impressed here is the magnitude of the work of restoring timber to from four to six millions of acres and doing it as promptly as possible. State work, however necessary, is always slow.

To plant an acre of young white pines 1,000 seedlings of say three years' growth would not be an excessive number; in fact, 2,000 would be nearer the mark. They are started close, in order that in search for sunlight, tall, straight trunks may be developed. As they grow and crowd each other, the weaker ones are removed. The process of thinning continues until the timber has reached marketable size. From the time the young trees are 20 feet high they begin to have a value, and by sale of those removed, income (small at first) begins to come in.

Starting then with the statement of 1,000 seedlings to the acre, one immediately recognizes that to plant 1,000 acres would require a million seedlings. The magnitude of the task becomes at once appalling. It is clear that if replanting the "cut-over" lands of the

State were immediately necessary to save the soil, the Commonwealth would be doomed. Fortunately, it is not necessary, however desirable it may be.

So far as the best statistical information can say, the available timber of the United States cannot possibly last longer than thirty years. It will naturally become higher in price as it becomes scarcer. There seems to be in sight no new supply to meet the coming deficiency in that time. The country can, however, be well on the way, first to save the soil, and second, to restore the timber, though the need for immediate action is urgent.

The policy adopted should be for such lands as are better adapted to the growth of timber than any other crop.

First. Replant the treeless land with seedlings of the most desirable species so far as possible.

Second. Carefully safeguard against fire the most promising lands on which there exists a reasonable stand of timber, and underplant in it the "shade enduring" species as much as possible.

Third. Protect the remaining soil of the steep, rocky, treeless parts by any growth, however worthless, if it will only afford a soil cover while living, and aid in producing soil when dead.

The first two propositions require here no further statements. The third should be amplified. There are thousands of acres, probably, densely covered with a low, much-branched, slow-growing tree known as scrub oak (*Quercus ilicifolia*, Wang.). The ground is usually poor, and sometimes it is both poor and rocky. But little soil appears. Such thickets may persist so long that it comes to be supposed nothing better ever



can be produced there. If, however, fire be kept off and the mould allowed to accumulate, at length other more valuable species may appear, struggle through the thicket of scrub oak, gradually overtop it, and then kill it out by the shade formed. Such illustrations of white, red, and scarlet oaks supplanting the scrub oak can be seen in Pike County, Pennsylvania.

The so-called scrub oak then seems to have a distinct value, because it is a good producer and retainer of soil, and also because it is preparing the ground for trees which have a value as timber. It holds in check ruinous soil-washing, and allows time for starting forests on soil which promises results in reasonable time.

Then there are other areas which, if fire allows, become speedily covered with a dense growth of sumac, blackberry bushes, and fire cherry, neither of which have any value in themselves, but which have quick growth and furnish soil cover, thus preventing, or at least holding, soil-wash in check.

Still another method of valuable time-serving policy is practicable. There are locations where the soil appears good, but for some reason or another trees have failed to grow. Such places often take kindly to grass and, as in Cameron County, a vigorous crop follows the accidental deposit of seed on the surface. Sod is, as we know, a good soil retainer. These grassy spots also resist the fire. The tops may, and do, burn completely, but the roots will speedily cover the surface with a new crop of verdure.

There are also extensive areas almost wholly occupied by huckleberry and blueberry bushes. These, too, are good soil retainers.

Lastly, there are rocky slopes upon which no vestige

of soil remains, and where nothing but lichens are found. These spots never can become worse and may well be neglected until the more promising locations have been cared for—but such apparently hopeless situations do have a distinct lesson, if we heed it, for they reveal the danger to the Commonwealth of neglecting to care for the thousands of square miles which, with greater or less rapidity, are going into just such an unproductive condition. Such an area is a gnawing, corroding sore in the heart of the State. It merits attention!

The lesson of these waste lands is: Plant what you can at once, and for the rest aid nature in covering them with whatever will grow best, and prevent destructive washing away of soil. Bear in mind that the whole problem of forest restoration is urgent, though some portions of the work are more urgent than others. Note, however, that where forest fires are tolerated, the best forestry efforts will produce small results.

Even under the most favorable conditions the State will, for many years, miss the income formerly received from its lumber industries, which once aggregated nearly \$30,000,000 annually as the lumber fell from the saw.

In strong contrast with our lack of care is the policy of Russia, which is said to still have 900,000,000 acres in one timber belt where, though wood is the general fuel, it may not be cut without official permission. No water protecting forest can be cut, no cattle are allowed to graze on lands until the trees are ten feet high, and all forests which guard against erosion of water or drifting sands are exempt from taxation.\*

\* See National Geographic Magazine, Vol. xxvi, pp. 483 and 486.





PROBABLY THE LARGEST WHITE OAK IN PENNSYLVANIA



The lumber industry in Pennsylvania has so long passed its best period and been on the wane that it may be said to have ceased as a dominant industry. Here and there a considerable operation exists, nearing its end, but even of these only a few remain.

Not only has the extended forest area disappeared, but the individual, maximum sized tree has become so rare that mention of the diameters of those occasionally found half a century ago excites expression of a doubt. For example, a chestnut tree having, at "breast-height," a circumference of  $27\frac{1}{2}$  feet; or white pines six feet in diameter, standing in the virgin forest; or the white oak still growing near Kutztown, Berks County, Pa. (facing this page), 31 feet in circumference at base of trunk, 74 feet high; limbs spread over 104 feet.

In connection with the newly started doctrine of conservation, which has taken hold of the nation so firmly, this waste land merits consideration. Money, industry, and whatever other elements of national prosperity entered into lumbering disappeared with the timber upon which they depended. Nothing took the place of the lumber industry. It was simply blotted out. This, of course, was unfortunate, but the worst feature was that the soil was practically abandoned and allowed to become, in many instances, not only hopelessly sterile, but an actual nursery of disaster, a source of danger to the productive portions of the State.

We properly condemn use of coal, which is non-restorable, when it is made to do the work of water-power, which is returned to us again and again for use, but what shall we say concerning a policy of soil

neglect until it ceases to produce anything needed or desired by man, and is, at the same time, becoming his active enemy? This is the light in which we must regard every extensive area that, instead of conserving rain fall, actually hurries it out of the country and carries productive soil with it.

There are in Pennsylvania several counties that were once prosperous, because rich in forests, but which are now reduced to an almost bankrupt condition because the timber is gone and the land is too poor and cold to encourage remunerative agriculture. What the future has in store for such regions is not yet apparent.

The forestry problem is thus seen to be a many-sided one. I have no desire to confine myself to such a statement as would bring undue discredit upon Pennsylvania, for she is in forestry work a pioneer among the States, as she also is a pioneer in conservation of our immense mineral wealth. It is simple justice to call attention to the restorative forestry agencies already started within the State limits.

Pennsylvania has now in Public Forest Reserve 1,001,227 acres, which she has acquired by purchase. It is especially worthy of note that from the date of the first purchase an effort has been made to place it under proper forestry conditions. In other words, we have no forest laws which retard or prohibit practice of forestry as a productive science. We have aimed at constructive rather than tentative forestry. That this policy has been successful is proved by the fact that land which fifteen years ago was purchased for \$2.50 an acre has now an estimated stumpage value of from \$13 to \$16 an acre. And it may be added that

this statement applies to areas embracing thousands of acres.

Amount paid thus far for land.....	\$2,281,385.17
Average price per acre.....	2.27
Roads, trails, and fire-breaks, repaired, rebuilt or new, about.....	6,000 miles
Number of seedlings planted.....	12,215,750
Area planted or restocked.....	6,000 acres
Total number of seedlings now in nurseries....	13,400,000
Number of seedlings available for planting in spring of 1915.....	4,000,000
Acreage in nurseries.....	25 acres
Fire towers and outlooks built.....	50
Miles of telephone bought or built for Forest Re- serves.....	130

These are substantial evidences of progress. They, in themselves, are unimportant except as they show underlying signs which express a fixed forest policy, backed by a considerable portion of public-spirited citizens.

It is, therefore, worth while to say that our Pennsylvania State Forestry Association has efficient representatives in every county of the Commonwealth, and that we have, in addition, the cordial support of the State Conservation Association, of the American Forestry Association, of the American Civic Association, and of the Women's Clubs of the State and of the lumbermen of the State. The Pennsylvania Forestry Association has, since 1868, published, once in two months, a modest, illustrated pamphlet, "Forest Leaves," which has reflected the activities of the Association and been very effective in placing the desires and purposes of the Association before the Legislature. The active support of the newspapers of the State has been a most helpful factor. The fact that thousands of our citizens camp annually upon the State Forest Reserves in search of

health and recreation has furnished a strong support to the forestry movement.

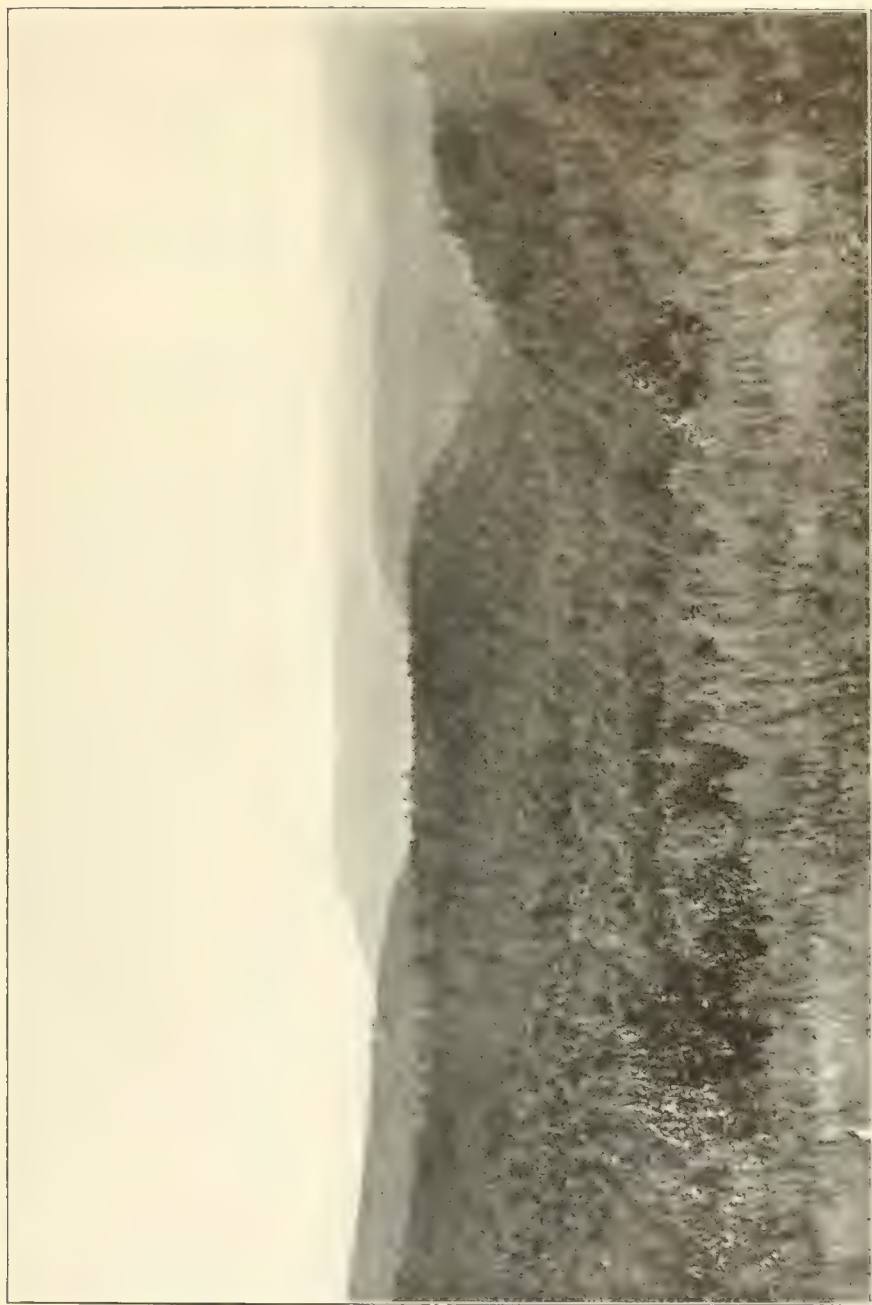
Our forestry reserves contain within them the headwaters of many streams, fountains of pure water, from which several towns are drawing their supply.

The net revenue from the forest reserves is to go mainly toward forming a State school fund, and it promises, in the not distant future, to be an important annual contribution. For every acre of forest reserve land in any county, a fixed sum of four cents an acre goes toward the roads or schools of the county. The reserves give employment to a considerable number of men as rangers or as laborers.

Recent legislative enactments have created a new class of lands known as Auxiliary Forest Reserves, into which the owner may place such lands as have suitable growing timber and have the tax reduced to a minimum, so long as the trees remain in healthy condition. When the timber is cut, the owner pays enough to compensate for the reduced tax rate while the timber was growing. It is worthy of note that though Pennsylvania was not the first State to pass these laws, the idea originated there and the first active measures to secure such legislation began there. These laws remove a tax burden which often was practical confiscation. They place the premium on growing timber and the penalty on cutting it!

When purchase of land for the State began, it was impossible to secure trained men to care for it. There was, at that time, nothing left for us to do but to train our own men. Out of necessity there grew up out of most humble beginnings what has developed into the State Forest Academy at Mont Alto. The State





OVERLOOKING THE HEAD-WATERS OF QUEENS RUN BEFORE THE TIMBER WAS REMOVED



educates its foresters there, free of all cost. There are now 60 out of 74 graduates of the school on duty in the forest reserves. A fine, trained, loyal body of young men who are, year by year, proving the wisdom of the policy which led them to, and prepared them for, the State service. Under these foresters there are 87 rangers, who, when not engaged in other duties, are constantly patrolling their reserves. There is also a high-grade forestry department in the State College.

Since 1883 eight successive Governors have lent their support to our forestry movement. Much of the ground that the cause has gained has been due to their friendly interest.

Our newly inaugurated Governor Brumbaugh has long been a positive advocate of progressive State forestry. We can not doubt that during his administration his sympathy will be with the work, and that so far as the many, varied interests of the State allow, he will guide and forward this work, "thus far so nobly advanced."

The Commissioner of Forestry is the head of a Department which is coördinate in official rank with the Department of Agriculture, or the Department of Education. This makes the head of the forestry work virtually a member of the Governor's cabinet, and permits full, direct exchange of views without intervening parties. It is to this, no doubt, that the State has been able to take and maintain a leading position in the forestry movement of the country.

The work thus far accomplished, important though it may be, is but a fragment of what remains to be done

before the State can again lay claim to the name (Pennsylvania) which was rightfully bestowed upon it.

It has cost us thirty-eight years of unremitting pioneer effort. A solid foundation has been laid upon which to build a modern, progressive forestry system.

It has been thought by others than the writer that this presentation of facts might be of service to the friends of forestry in other States than Pennsylvania, and that they might be encouraged by our ultimate victory after so many years devoted to creating public sentiment favorable to the movement. We must understand that the land is ours to use, to enjoy, to transmit; but that it is not ours to desolate, that we are bound to leave it in as good condition for those who follow us as we found it for ourselves.











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